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Research Article

The first epiphytic species of *Valeriana* in the world: *Valeriana rudychazaroi* (Caprifoliaceae)

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Abstract

The currently known species of *Valeriana* are herbs, shrubs, small trees and vines. After 20 years without new species of *Valeriana* in Mexico, here is described and illustrated the first epiphytic species in the genus. The species was found growing on *Quercus glabrescens* trees of the cloud forests from central Veracruz in eastern Mexico. It is known and described from very few specimens in the type locality. The most morphologically similar Mexican species are the vines *V. naidae* and *V. subincisa*, it was compared. Conservation assessment classifies this species under the Critically Endangered CR B1+B2ab(ii,v) category of the IUCN Red List Criteria.

Key words: Cloud forest, Dipsacales, endemic species, epiphytic species, Mexico

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Introduction

Valeriana L. (Dipsacales, Caprifoliaceae, Valerianoideae) is a genus of ca. 270 species distributed in southern Africa, the Americas and Eurasia. Its species are annual or perennial rhizomatous herbs, often semi-rosulate or rosulate, shrubs or subshrubs, small trees or lianas (Weberling and Bittrich 2016; Rabuske-Silva et al. 2020). Barrie (2003) states North American valerians are rhizomatous or tap-rooted perennial herbs, while South American species are herbs, shrubs and vines. The highest species richness, centres of origin and centres of diversification of *Valeriana* are in the southern Andes (Bell and Donoghue 2005; Bell et al. 2012; Luebert and Weigend 2014).

Recent phylogenetic and phylogenomic analyses classify *Valeriana* into the Valerianoideae clade of Caprifoliaceae and suggest the polyphyly of the genus (Bell and Donoghue 2005; Hidalgo et al. 2010; Lee et al. 2021; Wang et al. 2021). Further studies are needed to reveal the internal relationships in *Valeriana*. As a result of this, the morphological classification is followed to maintain a coherent group, *Valeriana* s.l., to avoid multiple generic segregations until most species be sequenced, as proposed by Christenhusz et al. (2018).

The most significant contribution to the knowledge of the Mexican *Valeriana* species was performed by Barrie (2003), where seven species and one variety

† Deceased.

were described, including a key for 39 species. In the same issue of the former publication, Rzedowski and Calderón de Rzedowski (2003a) published another two new endemic species from Mexico. Later, the taxonomic treatment for *Valeriana* species of the Bajío Region in central-western Mexico was published by the same authors (Rzedowski and Calderón de Rzedowski 2003b). Since that date, no new species for Mexico have been described. The only update to the known diversity of the genus in Mexico was the addition of *V. insignis* (Suksd.) Christenh. & Byng, with distribution from California to Washington, Arizona, US and Baja California, Mexico.

In contrast, in the last five years, many *Valeriana* species from South America have been described: *V. plateadensis* Á.J.Pérez, C.H.Perss. & J.N.Zapata, *V. yacuriensis* Sklenář & B.Eriksen, *V. xenophylloides* Sklenář & B.Eriksen (Persson et al. 2023), *V. praecipitis* A.E.Villarroel & Menegoz (Villarroel et al. 2022), *V. caparaoensis* Rabuske, Sobral & Iganci (Rabuske-Silva et al. 2020), *V. nahuelbutae* Penneck. (Penneckamp 2020), *V. sobraliana* Rabuske & Iganci (Rabuske-Silva and Vieira-Iganci 2019), *V. iganciana* Rabuske & J.Külkamp (Rabuske-Silva and Külkamp 2018) and *V. vilcabambensis* Sylvester & Barrie (Sylvester et al. 2018). Recently, the medicinal species *V. officinalis* gained great importance for being an important alternative in the treatment of anxiety disorders, insomnia and stress caused during the Covid-19 pandemic around the world (Frost et al. 2021; Pessolato et al. 2021; Bertuccioli et al. 2022).

Current botanical research has discovered striking and remarkable new species with evolutionary innovations for the genus to which they belong, like *Pinanga subterranea* Randi & W.J.Baker, the first known palm species flowering and fruiting underground (Randi et al. 2023; Kuhnhäuser et al. 2023) or *V. rupicola* Pansarin & E.L.F.Menezes, the first Neotropical rupicolous species of *Vanilla* (Pansarin and Fernandes-Menezes 2023). This paper describes the first epiphytic member of the genus *Valeriana* (Caprifoliaceae) in the world found in Mexico. The aims of this study are: 1) to describe and illustrate a new species of *Valeriana*; 2) to compare the new taxon with the known species from Mexico and 3) to evaluate the conservation status of the new species.

Materials and methods

This species was discovered in 2012 during botanical expeditions of Dr Miguel Cházaro-Basáñez (1949–2023), Dr Pablo Carrillo-Reyes and MSc David Jimeno-Sevilla in the Municipality of Tlacolulan, central Veracruz, Mexico. Miguel Cházaro determined this species as a new taxon and brought preserved specimens to Dr Jerzy Rzedowski (1926–2023) to confirm the status, obtaining the confirmation of this being a new species. A new collection was made by Miguel Cházaro-Basáñez and Rodrigo Carral-Domínguez in September 2020 to obtain specimens, geographic data and photographic evidence of the habit of this species.

Taxonomic determination

A literature revision was carried out to identify the taxon. The species was determined following the dichotomic key of the Mexican species of *Valeriana*, published by Barrie (2003) and compared with the species described by Rzedowski and Calderón de Rzedowski (2003a). Since that date, novelties and

nomenclatural changes of species distributed in Mexico have been looked for. Only the nomenclatural change of *V. insignis* (Suksd.) Christenh. & Byng, based on the basionym *Aligera insignis* Suksd. (Christenhusz et al. 2018), was found. The synonym of the latter, *Plectritis ciliosa* var. *insignis* (Suksd.) Dempster was treated by Moore (2012) in the Jepson eFlora of California as distributed in Baja California, Mexico. Morphological comparisons of similar species were made with the descriptions included in Barrie (2003) and Rzedowski and Calderón de Rzedowski (2003b).

Conservation assessment

Geographical coordinates were obtained in the field with a Garmin eTrex 10 GPS. Data were used for calculating geographic ranges of Area of Occupancy (AOO) and Extent of Occurrence (EOO) in the Geospatial Conservation Assessment Tool (GeoCAT, Bachman et al. (2011)), available at http://geocat.kew.org. Both estimates are required by the guidelines of the IUCN (IUCN Standards and Petitions Committee 2022) for conservation assessments. Scientific literature about threats in the distribution area was searched to select the risk category accurately.

English language revision

The artificial intelligence tool Grammarly Premium was used to corroborate the grammar and syntaxis of the manuscript.

Taxonomic treatment

Valeriana rudychazaroi **Cházaro, Franc.Gut. & J.R.Carral, sp. nov.**
urn:lsid:ipni.org:names:77332878-1

Diagnosis. *Valeriana rudychazaroi* can be distinguished from all the known species of the genus by its epiphytic habit on trees of *Quercus glabrescens* Benth. (vs. herbs, shrubs, subshrubs, small trees or climbing vines in the rest of the genus). It is morphologically similar to *V. naidae* Barrie and *V. subincisa* Benth., from which it differs by having thinner stems (0.25–0.6 cm vs. up to 2 cm in diameter in both species), leaves elongately spatulate (vs. ovate to elliptic or narrowly ovate to elliptic, respectively), inflorescence corymboid (vs. paniculoid in both species), inserted stamens in flowers (vs. exserted in both species), different shape of fruits (ovate vs. oblong to lanceolate in both species) and longer fruits (3–5 mm vs. 2–3 mm in both species).

Type. Mexico. Veracruz: Municipio Tlacolulan, Cerro de la Magdalena, 19°43'21"N, 96°59'09"W, 2900–2950 m elev., 20 September 2020, fl., fr., *R. Carral-Domínguez & M. Cházaro-Basáñez 766* (holotype: XAL!).

Description. ***Perennial gynodioecious epiphyte***, growing on branches of *Quercus glabrescens*, 45–80 cm tall. ***Roots*** fibrous. ***Stems*** terete, decumbent, 20–45 × 0.25–0.6 cm, branched in the basal portion, glabrous until the insertion of the central axis of the inflorescence, where is shortly pubescent with trichomes simple, trichomes up to 0.5 mm long. ***Leaves*** cauline and clasping, simple, opposite and decussate, persistent near the inflorescence, deciduous in late phenophases, elongately spatulate, 5.7–10.8 × 0.6–2.1 cm, apex obtuse, base

largely decurrent 1.5–3.5 cm long, slightly canaliculate, margin entire, one main nerve, slightly conspicuous on adaxial surface, prominent on abaxial surface, glabrous on both surfaces and margins. ***Inflorescence*** terminal, corymboid, dichotomously divided, each terminal corymb scorpioid without rotation, being less developed one of the lateral sides, 17–24 × 13–25.5 cm from the first division to the top and considering the lateral extremes of the inflorescence, main axis 10.1–21 × 0.11–0.25 cm measured from the base until the first bifurcation. Secondary axes 2, 2.9–6.0 × 0.05–0.2 cm, tertiary axes 4, 0.33–034 × 0.1 cm, decreasing dimensions as dichotomies increase, 31–85 flowers and less than five mature fruits per terminal corymb. ***Bracts*** narrowly lanceolate to lanceolate, 2.0–2.9 × 0.45–0.8 cm, base cuneate, apex acute, margin entire, glabrous, one main nerve. ***Bractlets*** of first division linear, longer than the fruits, 0.7–0.8 × 1–1.5 mm, base narrowly clasping, apex acute, margin entire, glabrous. Bractlets of corymbs linear, equal or shorter than the fruits, 1.5–5 × 0.5–0.8 mm. ***Staminate flowers*** white, 1.5 × 0.5 mm, calyx reduced, glabrous, corolla infundibuliform, tube 2–2.7 × 2 mm (opened), 5-lobed, corolla lobes elliptic to widely triangular, 0.5–0.8 × 0.4–0.5 mm, internally and externally glabrous, stamens 3, 1 mm long, adnate to the corolla in the middle of the length, anthers globose, 0.5–0.8 mm long, bithecal, glabrous; pistilodium 1.6 mm long, included, glabrous. ***Pistillate flowers*** white, 2 × 0.7 mm, calyx reduced, glabrous, corolla infundibuliform, tube 1.0–2.2 mm long, 5-lobed, corolla lobes orbicular, 1 mm in diameter, main style 2.7–5 mm long, exserted, glabrous; secondary styles reminiscent, inserted near 1/3 corolla length. ***Fruit*** a cypsela, ovate, 12 plumose limbs derived from calyx, 3–5 × 1–1.3 mm, with 3 veins on the abaxial side 1 on the adaxial side and 2 along the margins, glabrous on all surfaces (Figs 1–3).

Phenology. Flowering and fruiting recorded only in September.

Distribution and habitat. *Valeriana rudychazaroi* is only known from the type locality in cloud forests from central Veracruz in eastern Mexico (Fig. 4). There are no specimens deposited in major Mexican herbaria because of the rarity of the individuals and the difficult access to the branches of the hosts. The first collections of the species (previous to 2017) have been lost due to the death of Miguel Cházaro. During one decade of botanical explorations in the Cerro de la Magdalena Mountain and adjacent regions for floristic inventories and species descriptions (Lascurain–Rangel et al. 2017; Francisco-Gutiérrez et al. 2023a), very few specimens have been found and collected in the same locality of the type, some of them preserved as sterile material. The new species grows on very tall *Quercus glabrescens* (Fagaceae) trees, at altitudes of 3–6 m. It is distributed in the remnants of very humid pine-oak forests at elevations from 2,900 to 2,950 m. This species inhabits a zone of cloud forests on cliffs with strong winds rising from the Sierra de Chiconquiaco, Veracruz. The Sierra de Chiconquiaco is a biodiverse basin, home to 3016 species, the type localities of 72 species and 36 endemic species (Castillo–Campos et al. 2005; Lascurain-Rangel et al. 2017). The species is only known from the Volcán de la Magdalena Mountain in Tlacolulan, State of Veracruz, in eastern Mexico. From this mountain, the narrowly endemic species *Salvia chazaroana* B.L.Turner (Lamiaceae), *Lobelia biflora* Rzed. (Campanulaceae) and *Castilleja eggeri* Franc.Gut. & Cházaro were described. Species sharing the habitat are *Beschorneria yuccoides* K.Koch (Asparagaceae, Agavoideae), *Ageratina chazaroana* B.L.Turner (Asteraceae, Eupatorieae) and the epiphytic *Nelsonianthus tapianus* (B.L.Turner) C.Jeffrey (Asteraceae, Senecioneae).

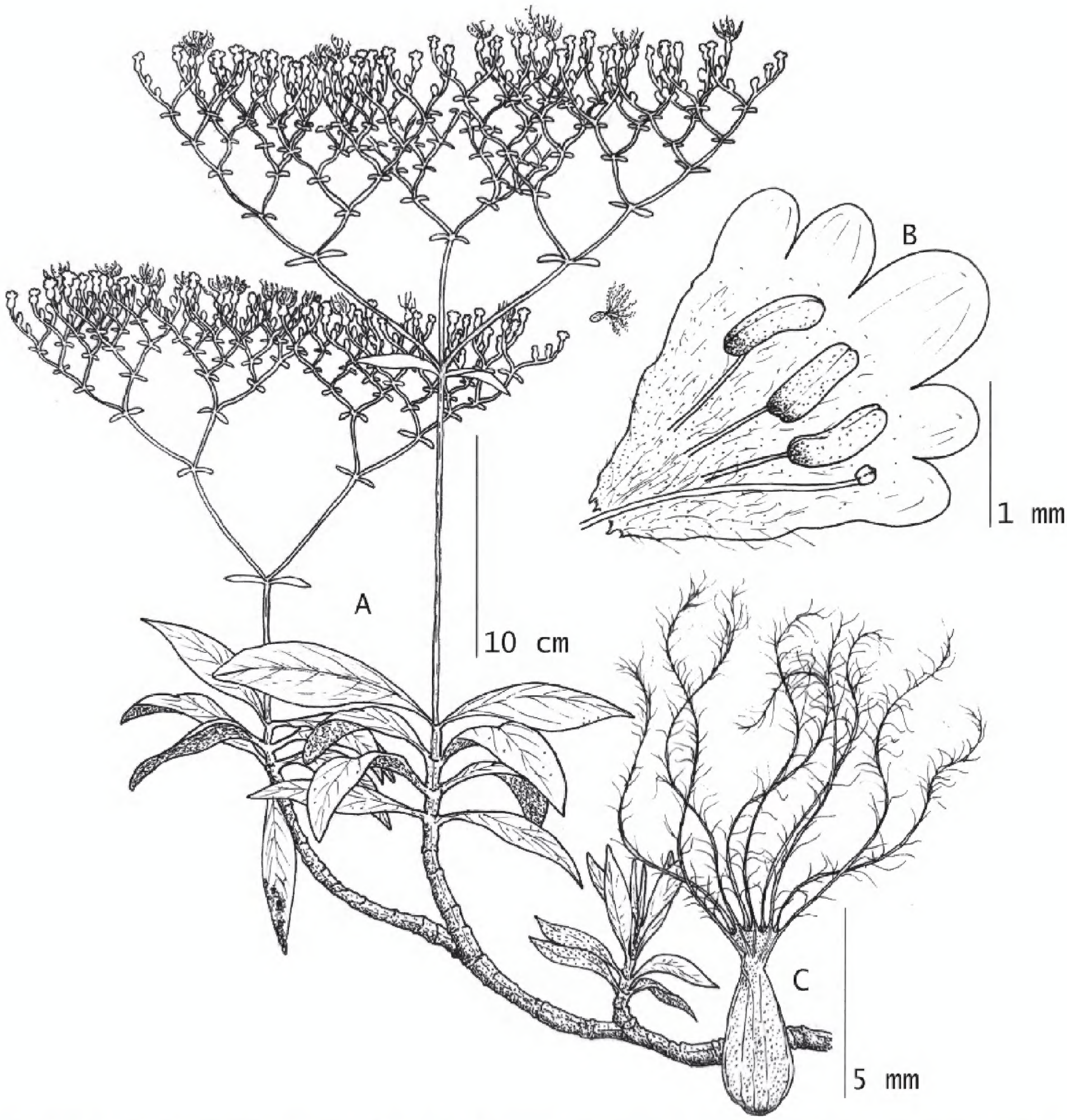

Figure 1. *Valeriana rudychazaroi* Cházaro, Franc.Gut. & J.R.Carral. **A** habit of flowering branch **B** staminate flower **C** fruit. Drawn from the holotype *Carral-Domínguez & Cházaro-Basáñez 766* (XAL). Illustration by Gerardo Andrade–Quintos.

Etymology. Miguel Cházaro dedicates the name of the species to Rudy Miguel Cházaro-Hernández, his beloved son, who, since an early age, has accompanied him on numerous botanical trips (Fig. 5). This is the second of a series of new species that Miguel Cházaro wished to dedicate to his children before he died on 4 April 2023. First, the species *Eugenia sarahchazaroi* Cházaro, Franc. Gut. & J.R.Carral was dedicated to his daughter, Sarah M. Cházaro-Hernández (Francisco-Gutiérrez et al. 2023b). A sketch of the life of Miguel Cházaro can be consulted in his obituary (Francisco-Gutiérrez and Vázquez-García 2023).

Conservation status. The new species has an Area of Occupancy (AOO) of 4 km^2 and Extent of Occurrence (EOO) of 0 km^2. A worrying situation for

Figure 2. *Valeriana rudychazaroi* on *Quercus glabrescens* trees in the field. Photograph taken by Rodrigo Carral-Domínguez.

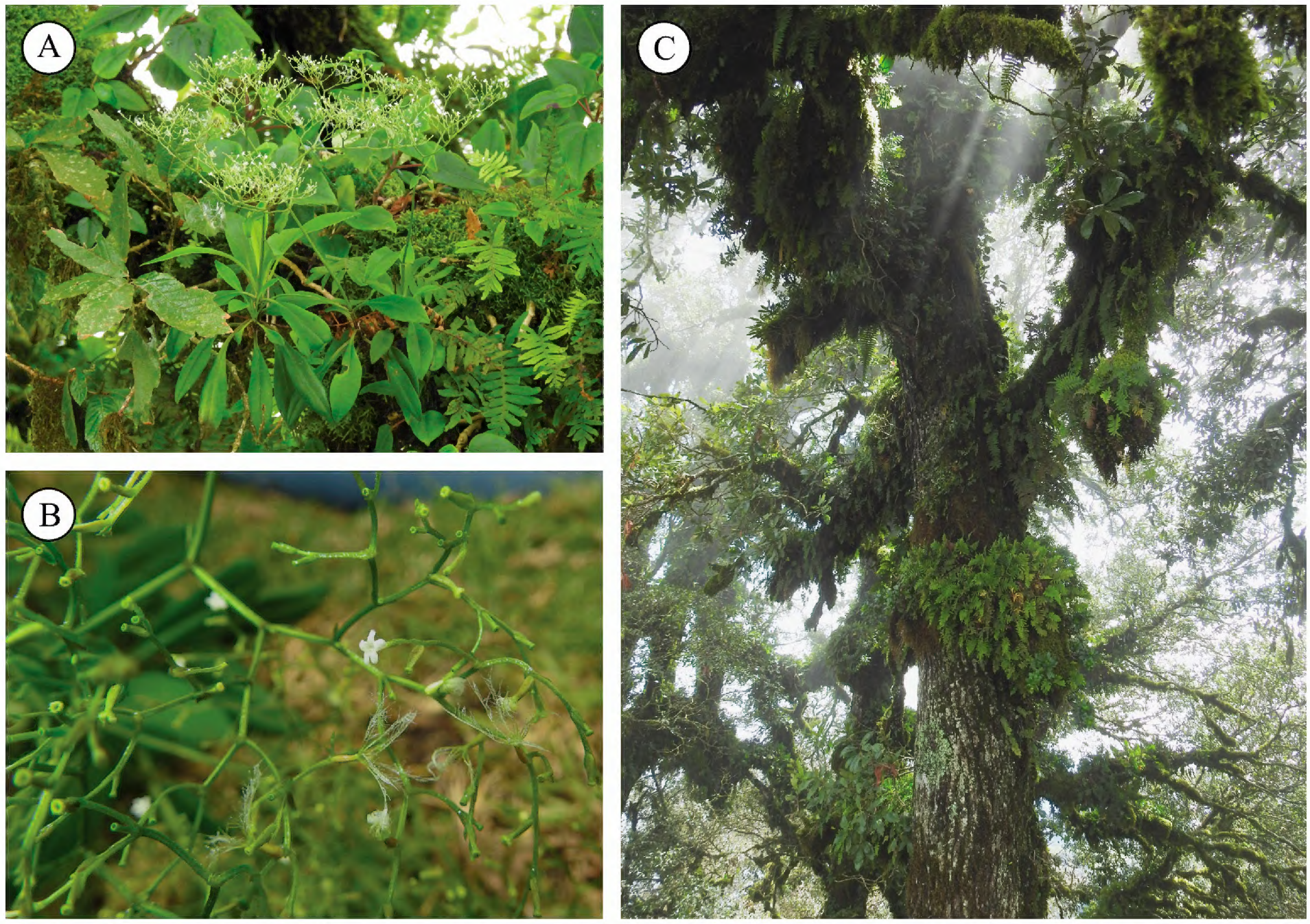

Figure 3. *Valeriana rudychazaroi* in the field. **A** habitat at an altitude of 3–6 m on *Quercus glabrescens* trees **B** detail of inflorescence with flowers and fruit **C** hosts in cloud forests from central Veracruz, Mexico. Photographs taken by Rodrigo Carral-Domínguez.

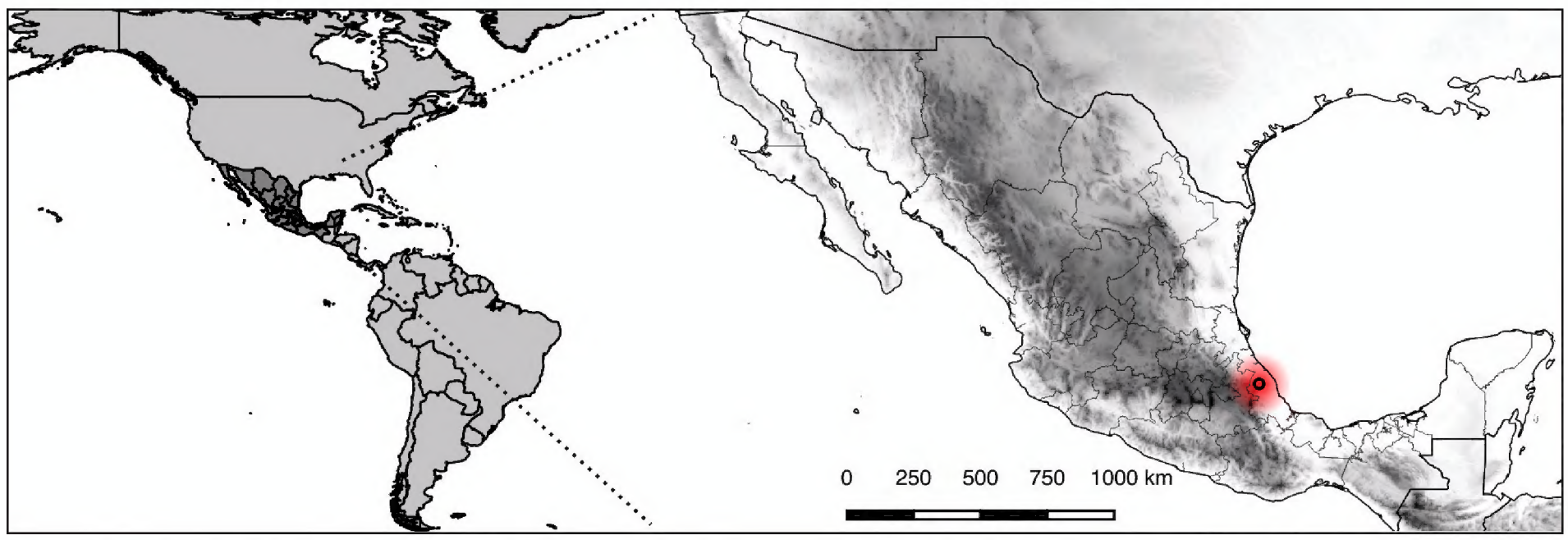

Figure 4. Distribution map of the epiphytic species *Valeriana rudychazaroi* in Mexico.

the conservation of this remarkable species is the overexploitation of oak trees that have been felled for charcoal production since the 1930's decade (Flores 1938). Besides, the cloud forest is the most endangered ecosystem in Mexico, with projections of high vulnerability in the face of climate change scenarios (Ponce-Reyes et al. 2012). That is why, given the reduced values of

Figure 5. Author and eponymy of the new species **A** Miguel Cházaro showing a specimen of *Valeriana rudychazaroi* next to its host, a *Quercus glabrescens* tree in Tlacolulan, Veracruz, Mexico (Author: Rodrigo Carral-Domínguez) **B** Rudy Miguel Cházaro-Hernández, son of Miguel Cházaro, during a botanical expedition at Barranca de Ramírez, 1981 **C** Miguel Cházaro and his son, to whom he dedicates the name of this new species (Author of **B** and **C**: Patricia Hernández-Romero).

AOO < 100 km^2, EOO < 10 km^2, number of locations = 1 and observed decline in quality of habitat, *Valeriana rudychazaroi* is classified under the Critically Endangered CR B1+B2ab(ii,v) category.

Discussion. *Valeriana rudychazaroi* is the first recorded epiphytic species in the genus. Previous works on worldwide *Valeriana* species reported habits of small trees, herbs, subshrubs, shrubs or lianas (Weberling and Bittrich 2016). Barrie (2003) reported five species of suffruticose or herbaceous vines in the country, while the checklist of Mexican lianas reported one, *V. subincisa* (Ibar-

Table 1. Comparison of morphological characters and phenology amongst the two climbing vines and the new epiphytic species of *Valeriana* from Mexico.

Character	*V. rudychazaroi*	*V. naidae*	*V. subincisa*
	Gynodioecious	Dioecious	Gynodioecious
Habit	Epiphytic herbs	Suffrutescent herbs or climbing vines	Herbs or climbing vines
Stems length	Up to 0.8 m	Up to 15 m	1–2 m (up to 10 m when climbing)
Stems diameter	0.25–0.6 cm	Up to 2 cm	Up to 2 cm
Leaves shape	Elongately spatulate	Ovate to elliptic	Narrowly ovate to elliptic
Leaves size	5.7–10.8 × 0.6–2.1 cm	1.5–8.7 × 0.8–4.1 cm	2–8 × 0.8–4 cm
Leaves apex	Obtuse	Acute	Acute
Leaves base	Largely decurrent	Connate	Cuneate to truncate
Inflorescence type	Corymboid mostly dichotomous with terminal branchlets scorpioid.	Paniculoid with terminal branchlets scorpioid.	Panicles mostly dichotomous with terminal branchlets scorpioid.
Stamens position	Inserted	Weakly to strongly exserted	Exserted
Fruit shape	Ovate	Oblong to lanceolate	Oblong to lanceolate
Fruit length	3–5 mm	2.2–2.7 mm	2–3 mm
Phenology	Flowering and fruiting only known from September	Flowering and fruiting October-May (Flowering March-June, fruiting May-July in Nevado de Colima.	Flowering November-July
Habitat and distribution	*Quercus glabrescens* cloud forests from central Veracruz	Fir forests, cloud forests from the Trans-Mexican Volcanic Belt	*Quercus* and *Pinus* humid forests, cloud forests from Tamaulipas and Nuevo León south to Veracruz (growing along the ground), also in Chiapas and Guatemala (generally scandent).
Source	This study	Barrie (2003)	Rzedowski and Calderón de Rzedowski (2003b), Barrie, pers. comm.

ra-Manríquez et al. 2015). Unlike the *Valeriana* species that are lianas, this species has short stems that are rooted on the branches of *Q. glabrescens* trees, flowering and fruiting without contact with the ground. Further studies on seed dispersal and the biology of the species are needed.

Barrie (2003) stated that there are seven species of *Valeriana* vines in the Americas, four endemic to the northern Andes, one endemic to Panama and Costa Rica and two in Mexico: *V. naidae* and *V. subincisa*. Following the dichotomic key provided in Barrie (2003) and considering the habit of this new species, it is closest related to this group, compared to the herbaceous species. Due to the absence of twining stems, the key for species showed the new species to be most similar to *V. naidae* and *V. subincisa*, to which it was compared. A detailed comparison is provided in Table 1. The contrasting differences in morphological characters and ecological features allow us to separate *V. rudychazaroi* from other species that overlap its distribution in western Veracruz in the Cofre de Perote Volcano (Barrie 2003).

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Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

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Author contributions

Conceptualization: AFG, MCB. Data curation: AFG. Funding acquisition: MCB. Investigation: RCD. Supervision: MCB. Visualization: RCD, AFG. Writing – original draft: AFG. Writing – review and editing: MCB.

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Data availability

All of the data that support the findings of this study are available in the main text.

References

Bachman S, Moat J, Hill AW, de la Torre J, Scott B (2011) Supporting Red List thread assessments with GeoCAT: Geospatial conservation assessment tool. ZooKeys 150: 117–126. https://doi.org/10.3897/zookeys.150.2109

Barrie FR (2003) Seven new species and one new variety of *Valeriana* (Valerianaceae) from Mexico. Acta Botanica Mexicana 62(62): 31–64. https://doi.org/10.21829/abm62.2003.914

Bell CD, Donoghue MJ (2005) Phylogeny and biogeography of Valerianaceae (Dipsacales) with special reference to the South American valerians. Organisms, Diversity & Evolution 5(2): 147–159. https://doi.org/10.1016/j.ode.2004.10.014

Bell CD, Kutschker A, Arroyo MT (2012) Phylogeny and diversification of Valerianaceae (Dipsacales) in the Southern Andes. Molecular Phylogenetics and Evolution 63(3): 724–737. https://doi.org/10.1016/j.ympev.2012.02.015

Bertuccioli A, Cardilani M, Di Pierro F, Magi S, Zonzini G (2022) A practical perspective in the use of botanicals during the COVID-19 pandemic: From proven to potential interactions. Journal of Medicinal Food 25(1): 1–11. https://doi.org/10.1089/jmf.2021.0062

Castillo-Campos G, Medina-Abreo ME, Dávila-Aranda PD, Zavala-Hurtado JA (2005) Contribución al conocimiento del endemismo de la flora vascular en Veracruz, México. Acta Botanica Mexicana 73(73): 19–57. https://doi.org/10.21829/abm73.2005.1004

Christenhusz MJM, Fay MF, Byng JW (2018) Plant Gateway's the Global Flora: A practical flora to vascular plants species of the world. GLOVAP Nomenclature Part 1 (Vol. 4.), Plant Gateway Ltd., Bradford, 155 pp. https://www.plantgateway.com/wp-content/uploads/lana-downloads/2018/02/Global-Flora-Vol-4.pdf

Flores T (1938) La zona carbonífera de Tlacolulan, Veracruz. Boletín de la Sociedad Geológica Mexicana 10(7–8): 189–202. https://www.jstor.org/stable/44173823

Francisco-Gutiérrez A, Vázquez-García A (2023) In memoriam Dr. Miguel de Jesús Cházaro-Basáñez (1949–2023). Revista Mexicana de Biodiversidad 94: e945265. https://doi.org/10.22201/ib.20078706e.2023.94.5265

Francisco-Gutiérrez A, Cházaro-Basáñez M, Avendaño-Reyes S (2023a) *Castilleja eggeri* (Orobanchaceae: Pedicularideae) a new endemic species from Mexico. Nordic Journal of Botany 2023(10): e04057. https://doi.org/10.1111/njb.04057

Francisco-Gutiérrez A, Cházaro-Basáñez M, Carral-Domínguez R, Narave-Flores H, Islas-Tello L (2023b) *Eugenia sarahchazaroi* (Myrtaceae, Myrteae), a new species from the cloud forest of Mexico. PhytoKeys 236: 53–64. https://doi.org/10.3897/phytokeys.236.111421

Frost R, Bhamra SK, Pendry B, Heinrich M (2021) COVID-19 and herbal practice: A United Kingdom practitioner survey. Advances in Integrative Medicine 8(4): 256–260. https://doi.org/10.1016/j.aimed.2021.09.003

Hidalgo O, Mathez J, García S, Garnatje T, Pellicer J, Vallès J (2010) Genome size study in the Valerianaceae: First results and new hypotheses. Journal of Botany 797246: 1–19. https://doi.org/10.1155/2010/797246

Ibarra-Manríquez G, Rendón-Sandoval FJ, Cornejo-Tenorio G, Carrillo-Reyes P (2015) Lianas of Mexico. Botanical Sciences 93(3): 365–417. https://doi.org/10.17129/botsci.123

IUCN Standards and Petitions Committee (2022) Guidelines for Using the IUCN Red List Categories and Criteria, version 15.1. Standards and Petitions Committee of the IUCN Species Survival Commission. http://www.iucnredlist.org/documents/RedListGuidelines.pdf [Accessed 23.06.2023]

Kuhnhäuser BG, Randi A, Petoe P, Chai PPK, Bellot S, Baker WJ (2023) Hiding in plain sight: The underground palm *Pinanga subterranea*. Plants, People, Planet 5(6): 815–820. https://doi.org/10.1002/ppp3.10393

Lascurain-Rangel M, Avendaño-Reyes S, Cházaro-Basáñez M, Geissert-Kientz D, Villegas-Patraca R, Gallo-Gómez CA, Gutiérrez-Báez C (2017) Floristic, vegetational and geographic characteristics of the Sierra de Chiconquiaco, Veracruz, Mexico. Botanical Sciences 95(4): 610–659. https://doi.org/10.17129/botsci.1111

Lee AK, Gilman IS, Srivastav M, Lerner AD, Donoghue MJ, Clement WL (2021) Reconstructing Dipsacales phylogeny using Angiosperms353: Issues and insights. American Journal of Botany 108(7): 1122–1142. https://doi.org/10.1002/ajb2.1695

Luebert F, Weigend M (2014) Phylogenetic insights into Andean plant diversification. Frontiers in Ecology and Evolution 2: 1–27. https://doi.org/10.3389/fevo.2014.00027

Moore AJ (2012) *Plectritis ciliosa*. In: Jepson Flora Project (Eds) Jepson eFlora. https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=38677 [Accessed 09.06.2023]

Pansarin ER, Fernandes-Menezes EDL (2023) A new remarkable *Vanilla* Mill. (Orchidaceae) species endemic to the Espinhaço Range, Brazil: Its phylogenetic position and evolutionary relationships among Neotropical congeners. PhytoKeys 227: 151–165. https://doi.org/10.3897/phytokeys.227.101963

Penneckamp DN (2020) *Valeriana nahuelbutae* sp. nov. (Caprifoliaceae), a new endemic plant from Nahuelbuta mountain range in central-south Chile. Phytotaxa 441(2): 217–220. https://doi.org/10.11646/phytotaxa.441.2.9

Persson C, Eriksen B, Pérez AJ, Zapata JN, Couvreur TLP, Sklenář P (2023) Three new species of *Valeriana* (Valerianoideae, Caprifoliaceae) from southern Ecuador. Phytotaxa 579(1): 047–053. https://doi.org/10.11646/phytotaxa.579.1.5

Pessolato JP, Rodrigues S de P, Sousa DA, Boiati RF (2021) Assessment of Valerian and *Passiflora* consumption during a pandemic COVID-19. Brazilian Journal of Health Review 4(2): 5589–5609. https://doi.org/10.34119/bjhrv4n2-126

Ponce-Reyes R, Reynoso-Rosales VH, Watson JEM, VanDerWal J, Fuller RA, Pressey RL, Possingham HP (2012) Vulnerability of cloud forest reserves in Mexico to climate change. Nature Climate Change 2(6): 448–452. https://doi.org/10.1038/nclimate1453

Rabuske-Silva C, Külkamp J (2018) *Valeriana iganciana* (Valerianaceae), a new species from the highland grasslands of Serra do Tabuleiro, Santa Catarina, Brazil. Phytotaxa 364(3): 275–282. https://doi.org/10.11646/phytotaxa.364.3.7

Rabuske-Silva C, Vieira-Iganci JR (2019) *Valeriana sobraliana* (Valerianaceae), a new species from Southern Brazil. Phytotaxa 423(1): 10–20. https://doi.org/10.11646/phytotaxa.423.1.2

Rabuske-Silva C, Sobral M, Vieira-Iganci JR (2020) *Valeriana caparaoensis* (Valerianaceae nom. conserv.), a new species from Southeastern Brazil. Systematic Botany 45(1): 219–225. https://doi.org/10.1600/036364420X15801369352496

Randi A, Petoe P, Kuhnhäuser BG, Chai PPK, Bellot S, Baker WJ (2023) *Pinanga subterranea*, a new arecoid palm from Borneo that flowers underground. Palms 67(2): 57–63. https://kew.iro.bl.uk/concern/articles/de820e60-4c53-44d8-921e-d95f554181d7

Rzedowski J, Calderón de Rzedowski G (2003a) Dos especies nuevas de *Valeriana* (Valerianaceae) del centro de México. Acta Botánica Mexicana 62(62): 65–71. https://doi.org/10.21829/abm62.2003.915

Rzedowski J, Calderón de Rzedowski G (2003b) Valerianaceae. Flora del Bajío y de Regiones Adyacentes 112: 1–61. http://inecolbajio.inecol.mx/floradelbajio/documentos/fasciculos/ordinarios/Valerianaceae%20112.pdf

Sylvester SP, Barrie FR, Sylvester MDPV (2018) *Valeriana vilcabambensis* (Valerianaceae), a new species from undisturbed upper montane forest of the southern Peruvian Andes. Novon 26(1): 16–21. https://doi.org/10.3417/2017033

Villarroel AE, Menegoz K, Le Quesne C, Moreno-González R (2022) *Valeriana praecipitis* (Caprifoliaceae), a species new to science and endemic to Central Chile. PhytoKeys 189: 81–98. https://doi.org/10.3897/phytokeys.189.73959

Wang H-X, Morales-Briones DF, Moore MJ, Wen J, Wang H-F (2021) A phylogenomic perspective on gene tree conflict and character evolution in Caprifoliaceae using target enrichment data, with Zabelioideae recognized as a new subfamily. Journal of Systematics and Evolution 59(5): 897–914. https://doi.org/10.1111/jse.12745

Weberling F, Bittrich V (2016) Valerianaceae. In: Kadereit JW, Bittrich V (Eds) The Families and Genera of Vascular Plants (Vol. XIV) Flowering Plants, Eudicots. Springer International Publishing, Switzerland, 385–401. https://doi.org/10.1007/978-3-319-28534-4_35